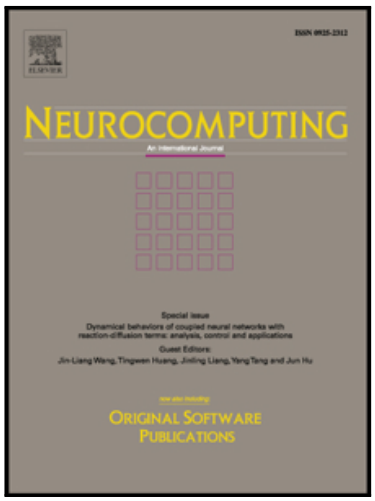

Neuro-Adaptive Observer based Control of Flexible Joint Robot

Xin Liu, Chenguang Yang, Zhiguang Chen, Min Wang, Chun-Yi Su

PII: S0925-2312(17)30818-4
DOI: 10.1016/j.neucom.2017.05.011
Reference: NEUCOM 18415

To appear in: *Neurocomputing*

Received date: 15 March 2017
Revised date: 12 April 2017
Accepted date: 8 May 2017

Please cite this article as: Xin Liu, Chenguang Yang, Zhiguang Chen, Min Wang, Chun-Yi Su, Neuro-Adaptive Observer based Control of Flexible Joint Robot, *Neurocomputing* (2017), doi: 10.1016/j.neucom.2017.05.011

Neuro-Adaptive Observer based Control of Flexible Joint Robot

Xin Liu[a], Chenguang Yang[a,b,*], Zhiguang Chen[a], Min Wang[a], Chun-Yi Su[a,c]

[a] *Key Lab of Autonomous Systems and Networked Control, School of Automation Science and Engineering, South China University of Technology, Guangzhou 510641, China.*
[b] *Zienkiewicz Centre for Computational Engineering, Swansea University, UK*
[c] *Concordia University, Canada*

Abstract

Due to high nonlinearity, strong coupling and time-varying characteristics of flexible joint robot manipulators, their control design is generally a challenging problem. There are inevitable uncertainties associated with their kinematics and dynamics, so that accurate models would not be available for control design. Furthermore, practically we may face the problem that state variables required by the controller are not measurable. In this paper, we focus on the study of control system design using a neural network observer to solve the aforementioned unmeasurable problem. First, we propose an observer based on Radial basis function (RBF) neural network to estimate state variables of the normal system. We then design the controller based on dynamic surface control method for a single link flexible joint manipulator whose model is unknown. The unknown model of the manipulator is constructed by RBF neural network. The stability of the observer and controller is shown by Lyapunov method. Finally, simulation studies are performed to test and verify the effectiveness of the proposed controller.

Keywords: Flexible joint manipulator system; Dynamic surface control; Neural network; State observer

*Corresponding author
Email address: cyang@ieee.org (Chenguang Yang)